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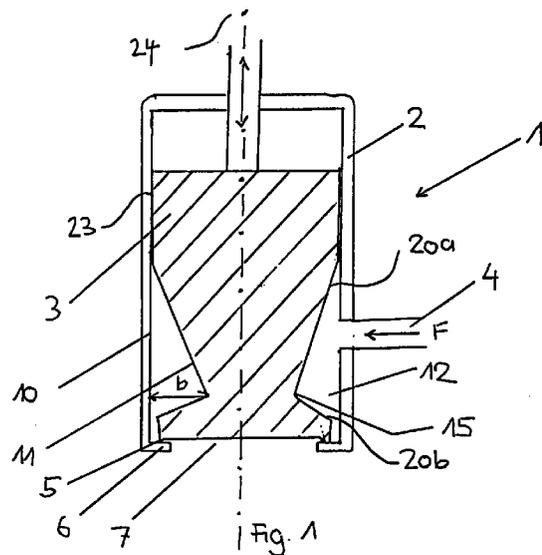
(72) Inventor: **Ruiz, Jesus**
1052 Le Mont-sur-Lausanne (CH)

(74) Representative:
Hepp, Dieter et al
Hepp, Wenger & Ryffel AG,
Friedtalweg 5
9500 Wil (CH)

(71) Applicant: **Sicpa Holding S.A.**
1008 Prilly (CH)

(54) **Valve arrangement for the delivery of fluids**

(57) A valve arrangement (1) for the delivery of fluids (F) consists essentially of a valve housing (2) and a closing element (3) movably arranged in the valve housing (2). The fluid is fed through a lateral inlet opening (4) into the inside of the valve housing (2). The fluid (F) may be delivered through an axial outlet opening (7). Between the outlet opening (7) and the inlet opening (4) there is provided a distribution space (12) which, at least with a closed valve arrangement (1), is in connection with the inlet opening (4). The distribution space (12) is limited on both sides by the inner surfaces (10) of the valve housing (2) and the outer surfaces (11) of the closing element (3).



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Description

The invention relates to a valve arrangement for the delivery of fluids.

For the temporary closing off or throttling of a gas, vapour or fluid flow, a multitude of different types of valves are known. It is for instance differentiated between straight-way valves with a linear fluid flow, corner valves with a bent flow and shuttle valves. In many areas of application, highly viscous fluids, for some part under pressure, are led through the valves. In spite of the high viscosity, the gas, vapour or fluid flow delivered from the valve should run as uniformly as possible. Particularly with valves in which a change in direction of the fluid flow is effected, it is difficult to achieve such a uniform delivery. With the valve closed, the fluid to be delivered presses laterally on a closing element, for example on a valve lifter. As soon as the closing element is moved away and thus the valve is opened, the fluid is delivered. When the highly viscous fluid enters laterally under pressure into the valve, it is often not possible for a delivery of the fluid in a straight jet. Depending on pressure and viscosity of the fluid, there results a deviation of the jet. The above mentioned problems are present for example with highly viscous fluids such as printing inks.

It is the object of the present invention to avoid the disadvantages of that which is known, in particular to provide a valve arrangement for the delivery of fluids, by way of which the delivery also of highly viscous fluids is possible in a uniform jet. A further object of the present invention lies in providing a valve arrangement which can be simply and cheaply produced and which is composed of as little as possible moving parts. The device according to the invention is also to be able to be cleaned in a simple manner.

According to the invention, these objects are achieved with a valve arrangement with the features of claim 1.

The valve arrangement having the features of the invention consists essentially of a valve housing and a closing element movably arranged in the valve housing. The valve housing is provided with a lateral inlet opening and an axial outlet opening. The outlet opening can be closed with a sealing section of the closing element in a valve seat of the valve housing. The valve seat is arranged axially at a distance to the inlet opening. So that a uniform delivery of also a highly viscous fluid, where appropriate under pressure, is made possible, between the valve seat and the inlet opening there is provided a circumferential distribution space which at least with a closed valve arrangement, is in connection with the inlet opening. In this context, highly viscous fluids are to be understood as fluids such as printing inks of which the viscosity is typically more than 2 Pa*s. On the one hand the distribution space is limited by the inner surface of the valve housing and on the other hand by the outer surface of the closing element. When the

valve is closed, the fluid fills the circumferential distribution space so that a uniform pressure prevails in the whole circumference of the closing element. As soon as the sealing section of the closing element is brought out of engagement with the valve seat, the fluid collected in the distribution space leaves the valve. Due to the homogeneous pressure distribution of the fluid in the distribution space, the delivery is effected uniformly.

The closing element is preferably axially displaceably mounted in the valve housing. Other arrangements however are also conceivable, for example a rotatable closing element, which by rotation opens or closes holes for the delivery of the fluid.

In a particularly advantageous embodiment example, the width of the distribution space continually reduces from a point of maximum width towards the outlet opening. With such a continuous reduction, a particularly homogeneous distribution of the delivered fluid jet may be achieved. The distribution space further advantageously extends up to or nearly up to the valve seat up to the sealing section of the closing element.

The distribution space is limited on the one hand by the outer surface of the closing element and on the other hand by the inner surface of the valve housing. For forming a distribution space, it is also conceivable to provide the outer surface of the closing element with a necking and/or the inner surface of the valve housing with an indentation. Both the embodiment examples are similar in their operative manner. The homogeneity of the delivered fluid jet is additionally increased by this. As a rule, any rotationally symmetrical arrangement is conceivable. It has been established that an arrangement with cone sections standing on one another, or with a curved surface of revolution like a paraboloid of revolution, or with a section of a spherical surface are particularly advantageous. Such surfaces permit a uniform discharge of the fluid over the surfaces concerned.

The invention is hereinafter described in more detail by way of embodiment examples and the drawings. There are shown:

- Figure 1 a schematic representation, in cross section, of a valve arrangement according to the invention, with the valve closed,
- Figure 2 the arrangement according to Figure 1 with the valve open,
- Figures 3 and 4 alternative embodiment examples of the distribution space, and
- Figure 5 a valve arrangement according to the state of the art.

A valve arrangement known from the state of the art is schematically shown in Figure 5. A valve housing 32 is provided with a lateral inlet opening 34 which can be

closed by a closing element 33 axially displaceable in the valve housing 32. In the closed condition shown in Figure 5, the fluid F presses against the outer surface of the closing element 33. For opening the valve arrangement, the closing element 33 is lifted and releases the inlet opening 34. The fluid F may enter into the inside of the valve housing 32 and is delivered by way of the outlet opening 37. Due to the pressure, the fluid F receives a lateral component, so that the fluid does not exit the outlet opening 37 parallel to the axis of the valve, but diagonally.

The valve arrangement 1 according to the invention which is shown in Figure 1 does not have these disadvantages. The valve arrangement 1 consists likewise of a valve housing 2 and in this, an axially displaceable closing element 3. The closing element 3 comprises a sealing section 5 by way of which said closing element presses against a valve seat 6 and thus closes an outlet opening 7.

A highly viscous fluid F with a viscosity of $\geq 2 \text{ Pa} \cdot \text{s}$ can be introduced into the inside of the valve housing 2 by way of an inlet opening 4. In direct connection with the inlet opening 4 is a circumferential distribution space 12, in which the fluid F collects with the valve closed. The circumferential distribution space 12 on the one side is limited by the inner surface 10 of the valve housing 2 and on the other side by the outer surface 11 of the closing element 3. The outer surface 11 of the closing element comprises a necking 15 which defines the maximum width b of the distribution space 12. In the embodiment example shown in Figure 1, the necking 15 is defined by the intersection point of two cone sections 20a, 20b standing on one another. The cone sections 20a, 20b form the outer surface 11 of the closing element 3 in the region of the distribution space 12.

In an upper section 23, the closing element 3 slides sealingly in the valve housing 2. The closing element 3 is movable in the axial direction by way of a drive arrangement 24 which is not shown in more detail. This may concern a manual, a motor or pneumatic drive. For opening the valve arrangement 1, the closing element 3 is lifted in the axial direction by way of the drive arrangement 24.

Figure 2 shows the valve arrangement 1 according to the invention in the opened condition. Between the sealing section 5 of the closing element 3 and the inner side 10 of the valve housing 2 there is formed an annular gap 22 through which the fluid F reaches the outlet opening 7. The fluid F first collects in the distribution space 12 and after the opening of the closing element 3, exits uniformly distributed over the circumference of the closing element 3 through the annular gap 22. The width of the distribution space 12 continuously reduces, from the point of maximum width b in the region of the necking 15, towards the sealing section 5. With this, a uniform as possible discharge of the fluid F is guaranteed. The distribution space 12 extends towards the seal arrangement 5 which itself has a certain axial

extension.

Essential to the invention is that with the valve still closed, the distribution space 12 is uniformly filled with fluid F, so that a uniform pressure builds up in the distribution space 12. On opening the valve arrangement 1, the fluid F exits through the outlet opening 7 under pressure which has the same magnitude over the whole circumference of the closing element 3. The delivered jet 9 of the fluid F thus, independently of the pressure and the viscosity of the fluid F, runs parallel to the axis of the valve arrangement 1.

Figures 3 and 4 show alternative embodiment examples of the distribution space 12. In Figure 3 the distribution space 12 is formed by an indentation 16 on the inner side 10 of the valve housing 2. The indentation is formed by a curved surface of revolution 21 and by the outer surface of a cylindrical closing element 3. The outlet opening 7 is closed by the sealing action between the sealing section 5 and the valve seat 6. With the valve closed, the fluid enters into the distribution space 12 similar as in Figure 1, and here distributes uniformly.

In Figure 4 a similar arrangement to that shown in Figure 1 is shown. The necking 15, in contrast to that embodiment example shown in Figure 1, is formed by a curved surface of revolution, typically a paraboloid of revolution. In both embodiment examples shown, the necking 15 or the indentation 16 defines the maximum width b of the distribution space 12. The width of the distribution space 12 continually reduces from the indentation 16 or the necking 15 towards the sealing section 5. The distribution space 12 extends up to the sealing section 5.

35 Claims

1. A valve arrangement (1) for the delivery of preferably highly viscous fluids (F), with a valve housing (2) and a closing element (3) movably arranged in the valve housing (2), said valve housing (2) comprising a lateral inlet opening (4) and an axial outlet opening (7) which can be closed with a sealing section (5) of the closing element (3) in a valve seat (6), wherein the valve seat (6) is arranged axially at a distance to the inlet opening (4), and wherein there is provided, between the valve seat (6) and the inlet opening (4), a circumferential distribution space (12) which is limited by the inner surface (10) of the valve housing (2) and the outer surface (11) of the closing element (3) and which, at least with a closed valve arrangement (1), is in connection with the inlet opening (4).
2. A valve arrangement according to claim 1, characterised in that the width of the distribution space (2) continuously reduces, from a point with maximum width (b), towards the sealing section (5).

3. A valve arrangement according to one of claims 1 or 2, characterised in that the distribution space(12) extends up to the sealing section (5).
4. A valve arrangement according to one of claims 1 to 3, characterised in that the distribution space (12) is formed by a necking (15) of the outer surface (11) of the closing element (3). 5
5. A valve arrangement according to one of claims 1 to 4, characterised in that the distribution space (12) is formed by an indentation (16) of the inner surface (10) of the valve housing (2). 10
6. A valve arrangement according to one of claims 1 to 5, characterised in that the distribution space (12) is formed rotationally symmetrical. 15
7. A valve arrangement according to one of claims 1 to 6, characterised in that the distribution space (12) is formed by two cone sections (20a, 20b) standing on one another. 20
8. A valve arrangement according to one of claims 1 to 6, characterised in that the distribution space (12) is formed by a curved surface of revolution (21), in particular a paraboloid of revolution or a section of a spherical surface. 25

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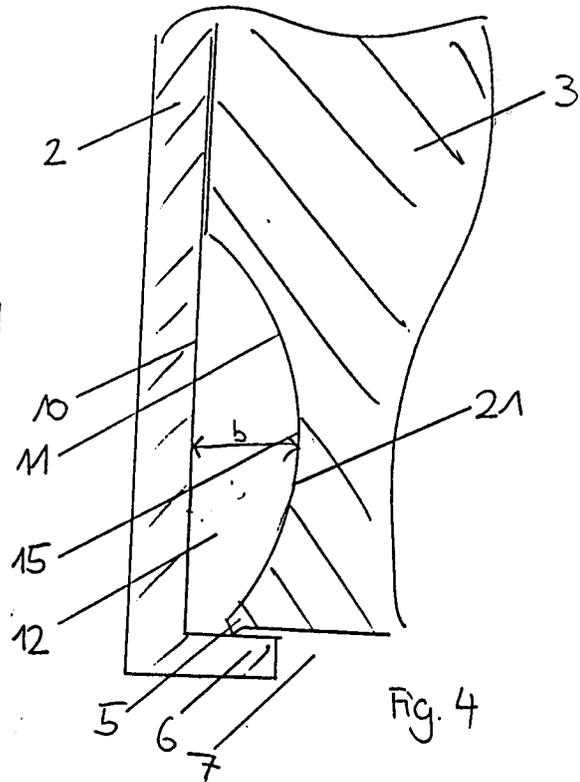
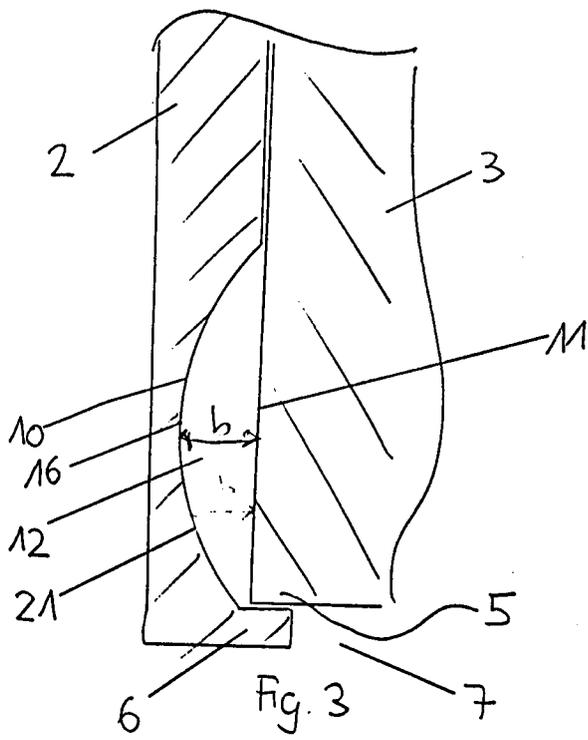
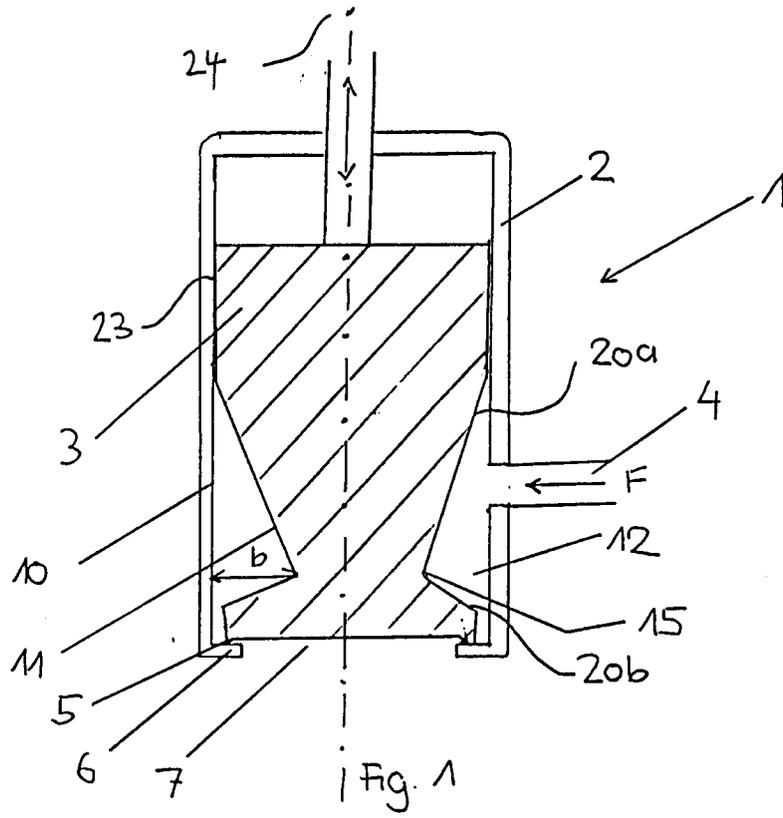
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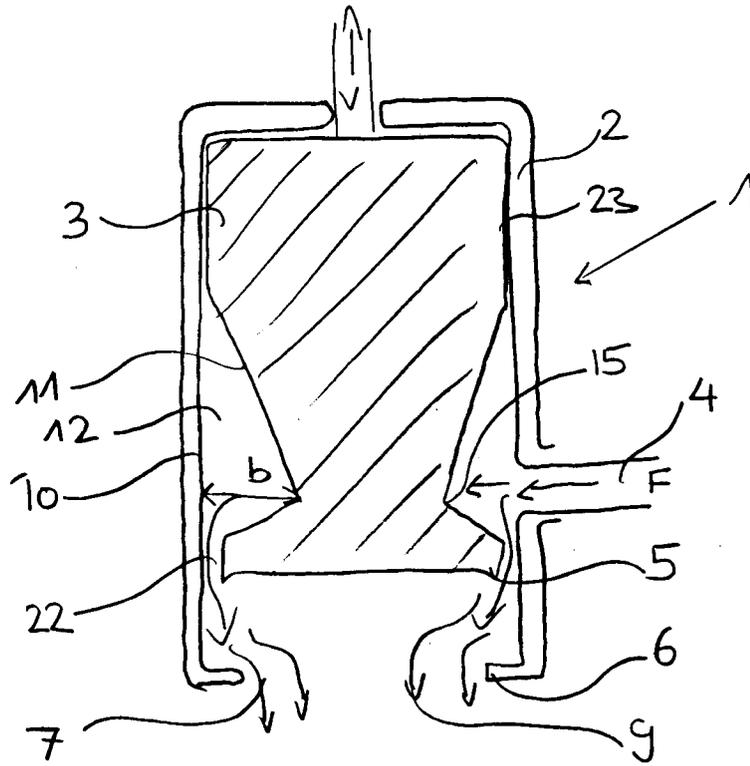


Fig. 2

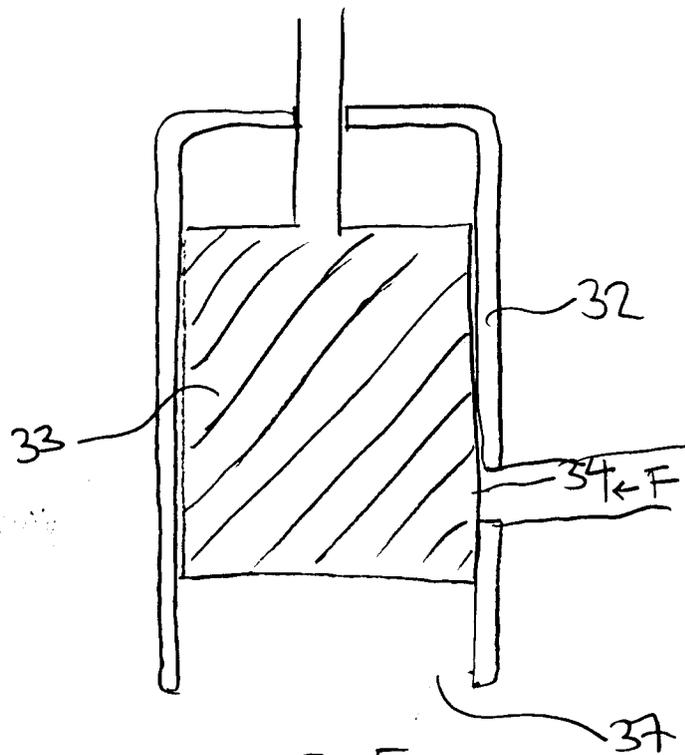


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 97 81 0379

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 3 286 736 A (GUILLERMIC) * column 2, line 50 - line 65; figure 1 * ---	1,6	F16K1/36 F16K1/52 F16K47/04
A	US 3 572 629 A (CLARK EDWARD COE) * figure 2 * ---	1-4,6,8	
A	US 4 634 095 A (TAYLOR JULIAN S) * column 3, line 34 - column 4, line 12; figure 1 * ---	1,2,4-6, 8	
A	DE 37 44 424 A (ODENDAHL WILHELM) * column 2, line 16 - line 66; figure 5 * -----	1-8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F16K
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		18 November 1997	Christensen, J
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